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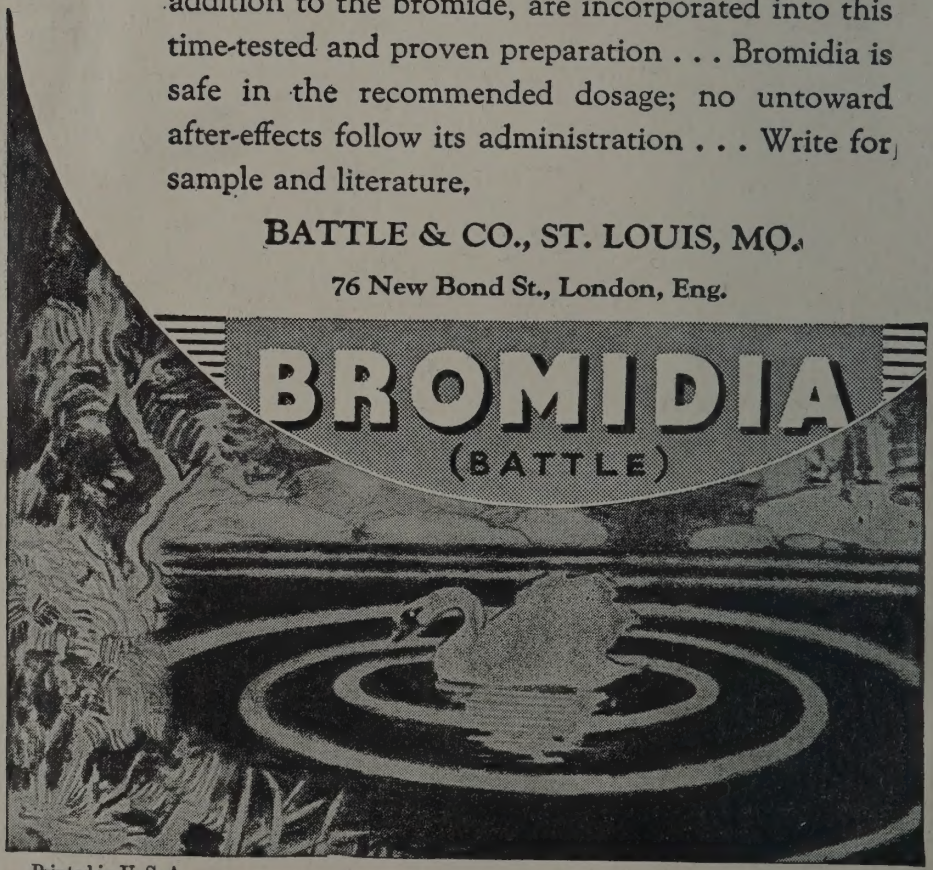

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EDITORIAL

Last year the Therepeutic Review inaugurated a change in policy. In place of abstracts and short discussions of numerous conditions, each Therapeutic Review now attempts to present an abridged summation of modern knowledge and clinical attitude in relation to a disease syndrome, a group of related conditions, or a problem intimately connected with practice. The subject first discussed was "Ulcerative Lesions of the Gastrointestinal Tract." This was followed by "The Female Pelvis from the Obstetric Standpoint".

When the new policy was inaugurated, the editor asked his readers for expressions of their reactions to the changed Therapeutic Review. Many commendatory letters came; no reader expressed regret at the change. Many suggestions for subjects for discussion were also received. So many requests were received for an exposition on "Nephritis", that this issue is devoted to an endeavor to comply with the desires of these interested readers.

Although it is manifestly impossible to cover this subject adequately in a limited space, an effort has been made to present sufficient material to be of value to the practitioner, and to stimulate him to further study of an interesting and not too well understood subject. This issue of the Therapeutic Review takes up the general considerations of nephritis and a discussion of acute nephritis; the next Therapeutic Review will conclude the presentation with a discussion of subacute and chronic nephritis.

The editor wishes to acknowledge his indebtedness to Christian and O'Hare and their excellent articles
Medicine) for much help in preparing

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NEPHRITIS

I

General Considerations

The importance of the kidney in vertebrate life was dramatically described by MacCallum in an address in which he stressed the importance of the renal function of regulation and maintenance of a stable fluid medium in the body. He said, in part: "There is in invertebrates no structure with a similar function or with a function even approaching that of the vertebrate kidney. It is this organ that has made a fundamental difference between the vertebrate and the invertebrate, not only in the struggle for existence but also in the capacity to evolve higher forms of animal life. This function of the kidney is fundamental, and is more ancient than that of excreting the waste products of the tissues of the body.

"In the long ages the kidney has thus performed a function which, for constance and unvarying regularity is unrivaled in the world of life. This constancy, this unvarying regularity, contrasts strikingly with the variation in function which the other organs have undergone and indicates how basic the kidney is in the vertebrate system and why it takes precedence in the body as a vertebrate organ par excellence."

Definition of Nephritis

Christian and O'Hare define nephritis as "a diffuse, progressive, degenerative or proliferative lesion involving the renal parenchyma, the interstitial tissue or the renal vascular system." Ordinarily, the changes found at autopsy are both proliferative and degenerative, but one or the other is apt to predominate. It is also found that, while all the renal structures are usually involved in the pathologic changes, these changes are prominent enough in one or other of the

tissues to warrant the pathologic diagnosis of interstitial, parenchymatous, or vascular nephritis.

Normal Renal Function

Claims have been made that the kidney may be an organ of internal secretion. These claims have not been substantiated. So far as is known, the sole function of the human kidney is one of excretion, and the most important activity in this excretory function is that of maintenance of equilibrium in body fluids.

The kidney does not synthesize substances, but it does change the proportion of the constituents of substances as they appear in the urine in contrast to their amount in the blood. How this is accomplished is not known. Various theories have been advanced, but Cushny's "modern theory" appears most acceptable. Cushny believes that the pressure of the blood in the glomerulus causes filtration of the plasma constituents through its wall which acts as a filtration membrane. Thereafter, certain of the substances in the tubules are absorbed, and this determines the final composition of the urine.

The blood supplied to the kidney is very abundant. Renal function is closely related to the general circulation and responds very quickly to changes in blood pressure. Therefore, it is obvious that renal blood supply is an important factor in determining renal function.

The normal reaction of the blood is slightly alkaline, while that of urine is slightly acid. This is due to the fact that the kidney acts as an eliminant of acids formed in metabolism. This function of the kidney is a very important one.

In addition, as emphasized by MacCallum, it must be remembered that the greatest usefulness of the kidney lies perhaps in the fact that it regulates and

maintains a stable fluid medium in the body, preventing dehydration or edema under normal conditions.

Albuminuria

One of the most delicate indices for disturbed kidney function is albuminuria. A transitory albuminuria may not be significant of actual kidney diseases, but it does indicate some departure from normal function. Persistent or recurrent albuminuria, however, particularly if accompanied by casts or blood cells in the urine, and if associated with edema or circulatory disturbance usually means nephritis in some form.

Orthostatic albuminuria, the appearance of albumin in the urine when the patient is in an upright position and its disappearance when the patient is lying down, does not indicate recognizable disease of the kidney, but it is, nevertheless, indicative of abnormality in functioning.

Albuminuria, together with casts and blood elements in the urine, may result from passive congestion of the kidney due to heart disease and circulatory changes. Such a condition usually clears up following effective treatment of the cardiac condition.

Febrile albuminuria usually complicates some infectious disease. As a rule the albuminuria clears up with the infection; if it persists it indicates a complicating nephritis.

Casts and Cells in the Urine

Casts and cells in the urine may be the transitory results of slight degrees of congestion or be due to irritants, such as ether, etc., and be of little significance. When persistently present, however, they indicate a definite renal lesion of some sort.

Casts are made up of materials which are excreted through the glomerulus into the tubules where they coagulate and are passed on into the bladder. The

various types of casts are dependent, for their particular characteristics, upon cells and cell remains or granules which become enmeshed by the original hyaline deposits. They are then termed coarse or finely granular, or blood casts when hemorrhage also takes place. When the types of casts are carefully differentiated, considerable information is available as to what process is taking place in the kidney.

Blood Pressure

The association of hypertension and nephritis is a commonly observed one but the relationship between the two is not so readily understood. In some cases of acute nephritis, hypertension appears to be directly related to the nephritis, inasmuch as the blood pressure readings rise and fall with the appearance and disappearance of the nephritis. In these instances, however, it is probable that both conditions are due to a toxic action affecting the vasomotor system. A similar relationship appears to exist between hypertension and a nephritis which is associated with edema of renal origin.

In certain other types of nephritis it would seem that hypertension is merely a coincident condition, probably due to the same factors which have given rise to the renal disease. It is, therefore, now believed by many that high blood pressure occurs quite independently of nephritis; some observers even believe that the hypertension may be the actual cause of the nephritis, due to the vascular lesion it may initiate in the kidney.

The conflicting ideas and opinions in regard to the relationship of hypertension and nephritis do not warrant drawing definite conclusions. It is certain, however, that high blood pressure in patients with nephritis is of great significance and must be taken into account when considering prognosis and treat-

ment. The combination of high blood pressure and impaired renal function makes for a bad prognosis.

The Heart

Several factors are involved in chronic nephritis which may bring about a disturbance of cardiac function. These are (1) increased blood pressure; (2) injury to the myocardium due to toxic substances, and (3) nutritional changes due to disturbance in the coronary circulation.

Nephritis may be present for long periods without causing any cardiac disturbance but sooner or later disease of the heart supervenes. Chronic hypertension usually plays an important part in bringing this about. The following cycle is a common one:

(1) A strong apex beat and accentuated second aortic sound are recognized before there is any demonstrable hypertrophy of the heart.

(2) The heart begins to enlarge, at first towards the left, and later towards the right. This hypertrophy becomes progressive.

(3) Evidences of cardiac insufficiency begin to appear. These are dyspnea, palpitation, precordial discomfort, irregularity, edema, pulmonary congestion, and congestion of the liver and kidneys.

(4) With the cardiac insufficiency, urinary output may decrease. Albumin and casts increase, and edema develops. It is important to always keep in mind the fact that edema in nephritic patients may be of either renal or cardiac origin. The cause of the edema must be differentiated, in order to treat it effectively.

Eye Changes

Examination of the eye grounds yields important information in the presence of nephritis. Abnormalities of the disc, the retina, or the retinal vessels are searched for.

Choked disc is a rarity, but papilledema is very common. Hemorrhage associated with papilledema is a serious condition.

Hemorrhages into the retina and other pathologic findings in the retinal vessels are of important prognostic significance.

Edema

Transitory edema often occurs in acute nephritis. In chronic nephritis with edema, the edema is often generalized, extensive, and persistent. It may be due to the renal condition or it may be circulatory in origin.

When the edema is of renal origin it will occur when cardiac function is unimpaired. This type of edema is not necessarily related to the severity of the disease. It may occur in acute nephritis with complete recovery, while severe cases of chronic nephritis occur without edema.

There is a close relationship between edema and decreased fluid output but this relationship cannot be simply explained as a failure to drain the tissues of their fluids because of inability to filter the water from the blood at a normal rate through a damaged filtration membrane in the glomerulus. Salt retention in the body is only one factor. A decrease in salt intake may cause the edema to disappear in some instances, while in others edema persists in spite of a salt-free diet.

Numerous theories have been advanced to explain the edema of nephritis, but about all that can be said at the present time is that it is probably due to several factors.

Salt and fluid intake undoubtedly play an important part, important enough to warrant their reduction in therapy, but as to fundamental causes and how they act there is much yet to be learned.

Uremia.

Uremia is a complex process which is not readily defined. Foster says that "by uremia we understand an intoxication, manifested by psychomotor disorders which is apt to supervene in nephritis". Foster groups the symptoms of uremia into three definite types of disturbance: (1) convulsive or epileptiform, with headache and amaurosis preceding coma; (2) gradually deepening coma, without psychic disturbance or signs of motor irritation; (3) psychic disorders, hallucinations and delusions, often accompanied by gastrointestinal disturbances, visual disturbances, and demonstrable lesions in the eye grounds.

Cerebral edema and acidosis may be factors in the production of uremic symptoms. It is not probable that uremia is due to any single cause, but more likely that it results from retention of products normally excreted in the urine, possibly aided by cerebral edema or acidosis. It may occur in acute nephritis, with complete recovery and without recurrence, but much more frequently develops in chronic nephritis, particularly in nephritis without edema. In these latter cases it may be a terminal event or may be followed by complete recovery from the uremic symptoms. The attack may develop suddenly or gradually, with or without prodromal symptoms, such as headache, nausea and vomiting, restlessness, drowsiness, muscular twitchings, or coarser muscular movements. These signs and symptoms may be followed by convulsive or epileptiform seizures, delirium, various psychoses, transient blindness, and progressive coma. Cheyne-Stokes respiration frequently accompanies an attack.

The following description of a uremic attack is given by Herrick: "When a convulsion occurs there is seldom any aura, as in epilepsy, nor is there the cry

so often heard in that disease. The eyes roll upward and usually to one side, the pupils dilate, and for a moment the patient seems gazing with a fixed stare into distance. Then a jerking of the angles of the mouth is seen, the head draws to one side, the muscles of the face and neck become clonically convulsed, the fingers and arms are flexed and likewise convulsed, and soon the entire musculature of the body is in irregular, jerky, violent motion. The face becomes livid or purple; foamy saliva issues from the mouth, and it may be streaked with blood that comes from a bitten tongue. The pulse grows rapid and weak, perhaps irregular. During the seizures there may be involuntary evacuation of urine and feces. A few seconds or minutes are consumed by the attack, which ends with a quieting of the muscular spasm, a deep-drawn inspiration, and a rather prompt recovery of consciousness. If, however, the patient has been in a stupor or coma preceding the convulsion, or if the attacks are frequently repeated, sleep, stupor, or deep coma will follow. Usually the patient is somewhat dazed for a time, and knows little more of the attack than that 'something has happened.' When attacks are repeated at short intervals the temperature often rises and preagonal temperatures of 105° F. or over are not unusual. The pulse, after frequently repeated convulsions, becomes rapid and weak."

Etiology

In discussing the etiologic factors of nephritis, the condition will be divided into the two general classifications of acute and chronic.

Acute Nephritis

Most cases of acute nephritis result from infection. The streptococcus is the usual offending organism, and tonsillitis the most common causative disease. Infec-

tions of the nasal sinuses or of teeth may be portals of entry for the streptococcus.

Any type of acute infection may cause an acute nephritis. Diphtheria, pneumonia, and erysipelas are not frequent precursors but typical cases sometimes complicate these diseases. Meningitis and typhoid fever are rarer causes. The acute exanthematous diseases frequently give rise to acute nephritis; scarlet fever is unquestionably the most frequent offender of these. Certain toxic substances, such as mercuric chloride, arsenic, lead, etc., are capable of producing acute nephritis. Alcohol probably is not a cause. Although direct evidence is lacking, it is probable that acute nephritis may result from intestinal intoxication. An acute renal disturbance very commonly occurs during pregnancy but it is not certain whether this condition is an acute nephritis or not.

Chronic Nephritis

While much uncertainty exists as to the cause of many cases of acute nephritis, the ascertainment of the etiologic factor in chronic nephritis is even more difficult. Subacute or chronic nephritis with edema sometimes appear to bear a relationship to a preceding infection or infectious disease, but such a relationship can rarely be traced in chronic nephritis without edema.

Chronic infections seem to be of little importance as causes of chronic nephritis. Chronic poisoning such as lead poisoning, will cause chronic nephritis, but such cases are relatively few. There has been much speculation about food as a cause, and it is now recognized that wrong foods may have a bearing in its etiology. There is no real proof and little good evidence to the effect that alcohol plays an important role in causing nephritis.

So little is known about the etiology of chronic nephritis that it is seldom possible to do more than venture a guess as to the cause in any particular case.

Examination of Nephritic Patients

A brief mention of the important steps in the examination of a patient with nephritis should not be amiss.

The first step should consist of a careful and complete history, followed by a thorough general physical examination. A study of the heart and circulatory system is of particular importance. Careful percussion will disclose the size of the heart; the findings may be substantiated by an x-ray examination if desirable. The rhythm of the heart can be analyzed satisfactorily with a stethoscope, and further information is obtainable by means of the electrocardiograph. A study of the pulse will aid in determining any changes in the vessel walls, variations in pulse wave, and the characteristics of the pulse rhythm. The blood pressure, both systolic and diastolic readings, is readily obtained with a manometer.

Ophthalmoscopic examination should be a routine part of the examination.

Periodic weighing of the patient serves as an index of variations in edema, and is an indication of the adequacy or inadequacy of the diet.

Analyses of the blood and urine constitute methods for following the progress of nephritis. Urinalysis is, of course, an important aid in diagnosis as well.

There are three tests of renal function worthy of use in arriving at a diagnosis, as well as for following the progress of the disease. These are (1) the two hour or concentration test; (2) the phenolsulphonephthalein test; and (3) determination of the total non-protein nitrogen or of the urea nitrogen of the blood.

Classification of Nephritis

For the purpose of considering nephritis in its various forms, the classification of Christian and O'Hare, slightly modified, will be followed.

I Acute nephritis
II Subacute nephritis
  a) With edema
  b) Hemorrhagic nephritis
III Chronic nephritis
  a) With edema
  b) With hypertension

Christian and O'Hare consider two further classes which will not be taken up in this discussion. They are:

IV Essential vascular hypertension progressing into chronic nephritis
V Renal arteriosclerosis progressing into chronic nephritis

II

Acute Nephritis

Acute nephritis, most often a complicating factor in infections such as tonsillitis, scarlet fever, etc., has a more or less acute onset, and displays a greater tendency toward improvement and cure than nephritis of a chronic type. It is much more common in children and young adults than in middle life or old age.

Signs and Symptoms

Very frequently, acute nephritis exhibits no symptoms; it may be discovered only through routine examination of the urine. On the other hand, the affection may be a very severe one.

Constitutional Symptoms

Unless edema is present, or the urinary findings of nephritis have been accidentally discovered, the symptoms which lead the patient to consult a physi-

cian are vague and indefinite, such as malaise, indefinite headache or body pains, sometimes pain and tenderness in the loin, frequently a slight fever, and occasionally nausea and vomiting. Chills are quite unusual.

Edema

Edema is the most commonly encountered sign in acute nephritis; it varies greatly in extent in different patients. One of the earliest manifestations of this edema is a puffiness of the face, particularly about the eyes. Unless the disease is checked, this puffiness has a tendency to spread over greater areas. It is most marked in dependent parts such as the ankles, hands, and in the loose areolar tissues about the genitalia, but eventually may be noted in any and every portion of the body.

Renal edema differs from cardiac edema in that cardiac edema is much more definitely related to the effects of gravity. Cardiac edema of the lower extremities, for instance, disappears upon lying down, while renal edema is frequently more marked upon arising in the morning after a full night's rest in bed. Ascites is less common in the presence of strictly renal lesions than in cardiac conditions.

Urinary Disturbances

The amount of urine excreted is practically always decreased, and the resulting concentration leads to a higher specific gravity and a stronger reaction of acidity. Hematuria is almost constantly present in acute nephritis and represents the cardinal sign of this disease. The degree of hematuria cannot be relied upon to indicate the severity of the affection, but it does roughly indicate the acuteness of the process.

Albuminuria is another almost constant feature in acute nephritis, but this sign is encountered in any type

of nephritis. The amount of albuminuria found may vary from a small amount to an amount which almost solidifies the urine when precipitated. The degree of albuminuria does not represent a good measure for estimating the severity of the disease. Persistence of albuminuria, however, indicates failure on the part of the kidney to recuperate. Fibrinuria is a rare urinary sign.

Casts are practically always found in the urine of an acute nephritic patient, frequently in great profusion. Any or all types of casts may be seen.

The urine usually contains some renal epithelial cells and leukocytes in the sediment.

Blood chemistry usually shows a nitrogen retention, and this is accompanied by a decreased amount of nitrogen in the urine.

Sodium chloride excretion may be very much decreased. When such is the case there is usually a water retention in the tissues and a consequent edema.

Renal Function

Renal function tests are important in all types of nephritis. It will be impossible to discuss these tests adequately in this presentation. Phenolsulphonephthalein excretion may be decreased or normal. An early low figure or a persisting low level of excretion is indicative of a severe lesion. In the beginning of an acute nephritis, blood nitrogen determinations usually yield normal figures; later they are frequently abnormally high.

Blood creatinin and uric acid tests are apparently of little value.

The two hour renal test cannot be used when the urinary output is small, as is common in acute nephritis. When possible to carry out this test, it may afford

considerable information during the acute stage. During convalescence it may indicate disturbed renal function even when other tests are normal.

Uremia

While uremia may occur in acute nephritis, it is not a frequent complication.

Cardiovascular Changes

Blood pressure is increased in the presence of a severe lesion, but the increase is usually a moderate one. In the presence of marked toxic symptoms, however, the blood pressure may be quite high. This is particularly true when there is a definite uremia.

Arterial changes are not brought about by nephritis in an acute stage. The same holds true as regards the heart. Evidences of arteriosclerosis or myocarditis during acute nephritis are almost invariably coincidental signs.

The Blood

Acute nephritis of moderate severity seldom gives rise to anemia. In the presence of hematuria and a toxic condition, secondary anemia may develop. It rarely becomes a serious factor. A slight leukocytic increase is often present but if the leukocytosis is marked it should arouse suspicion of an infection elsewhere.

Occular Changes

The patient frequently complains of blurred vision and flashes of light or specks before the eyes. Transient blindness is an infrequent occurrence. Retinitis is rare. Edema of the optic disc may be observed in very rare cases.

Diagnosis

The diagnosis of acute nephritis can usually be made with little difficulty from the symptoms and the

urinary changes, but it is sometimes difficult to ascertain whether the condition is a true acute nephritis or an acute exacerbation of a chronic lesion.

The history is often very helpful in making a differential diagnosis. Very high blood pressure, particularly when associated with hypertrophy of the heart; extensive retinal changes; and marked disturbances of renal function are suggestive of an underlying chronic affection. Restoration to normal function, however, indicates the absence of a chronic nephritis.

It may, in some instances, require deep study and observation during the convalescent stage to arrive at a correct differential diagnosis, but actually the diagnosis is, as a rule, quite simple.

Prognosis

The immediate prognosis is almost always good. Most patients with acute nephritis recover completely; a few progress into the chronic stage and succumb within a comparatively short time; others, after apparently recovering completely, may later show signs of a chronic lesion.

Uremia in acute nephritis does not have the serious prognostic significance that it has in chronic nephritis; complete recovery frequently follows the exhibition of uremic symptoms. Long persisting hematuria or albuminuria is likewise frequently followed by complete recovery.

Treatment

Drugs play a very insignificant part in the treatment of acute nephritis. Therapy consists principally in management which can be discussed under a very few classifications.

Rest and General Care

The patient with acute nephritis should be confined to his bed for a considerable period of time. This is the most important feature in treatment. Fresh air should be provided, but the body must be protected against chilling. When the weather permits, it is wise to move the bed so that the patient may spend a part of the day outside, except in the very acute stages.

The bowels must be kept open, but vigorous catharsis is contraindicated except in uremia. Rest for the kidney is sought by prescribing a bland diet and by restricting the fluid intake.

When to relax the restrictions is a difficult question to decide at times. In general, it may be considered that four weeks of bed rest is a safe minimum. If, at the end of this time, no blood is found in the urine and the tests for renal function show normal, the patient may be allowed out of bed for a short period each day. The out-of-bed periods are increased each day and, when the patient seems capable of it, moderate exercises are added to the daily routine. This procedure is carried on gradually until the patient is able to carry on in his usual occupation. If, during convalescence, there is a recurrence of blood in the urine there must be a return to less activity. Each case is one unto itself; individual characteristics will modify management. General rules will not apply to all. Therefore, much is left to the judgment of the attending physician.

Diet

During the acute stages it is probably best to put the patient on a straight milk diet (800 to 1000 cc. per day) or a milk diet with the addition of a few crackers or white bread. When the disease is ushered in with nausea and vomiting it is frequently best to starve the patient for twenty-four to forty-eight hours, allowing him cracked ice to keep his throat moistened and supplying fluids per rectum by the Murphy drip method. When there is no nausea, a little cream and unsalted butter may be added to the milk and bread diet, in order to better satisfy the appetite of the patient. It must be remembered that such a diet is a deficient one, and should not be persisted in for more than a few days or, exceptionally, one week. Following the milk or modified milk diet, the caloric value is increased by adding carbohydrates and fats principally; the protein and salt content should be kept low. Diet lists as used in the larger hospitals are readily available, but a low-protein, salt-free diet can be easily constructed by any physician;

a wide range in the constituents of such a diet is possible. Care should be taken to see that the diet is not deficient in vitamins.

During the acute stages the diet should be practically salt-free, but it is not necessary to insist upon this rigid restriction for any length of time unless there is a persistent edema. After the first few days, enough salt may be added to the foods to make them palatable. Some restriction in salt intake is desirable, however, until the condition has entirely cleared up.

Fluid Intake

Under average conditions the amount of fluid given should be sufficient to satisfy thirst, but not enough to give a disagreeable feeling of being overfilled. Unless there is considerable edema, there is no reason for greatly restricting the fluid intake.

During the early acute stages the intake may be limited to 1000 cc. per twenty-four hours. If the weather is very hot and sweating is profuse, more water will be needed. The same holds true if there is much nausea and vomiting. This will prevent dehydration.

If edema is excessive, the fluid intake must of necessity be much limited. In these cases, thirst may be relieved by allowing the patient to suck ice. In uremia, a part of the treatment consists in the stimulation of all the organs of elimination, and an increase in the fluid intake will be necessary.

Drug Treatment

Diuretics in acute nephritis hold a position of questionable value. Many authorities do not use them at all. If a diuretic is to be used, there are several which appear to be safe. Water is the simplest and blandest of all the diuretics and may be used when restriction of fluid intake is not indicated. Caffeine, diuretin, theocin, and other modifications of theobromine, caffeine, and theophyllin may be tried. Digitalis is sometimes advised, but it is questionable if this drug exerts any diuretic action in the presence of a normal circulation. Calcium has also been advised, but it is doubtful if this product is indicated in acute nephritis.

Sodium or potassium salts of citrate, acetate, or tartrate have been much used. The basis for the use of these drugs is that of alkalinization which certain authorities now believe to be contraindicated in the average case of acute nephritis. Ordinarily, however, these drugs will do no harm. They might prove of some value in very advanced stages of nephritis where acidosis is an important feature.

Cathartic drugs may be necessary in the treatment. Daily catharsis is indicated, and should be obtained through mild laxatives

such as cascara, phenolphthalein, or aloin, strychnine and belladonna pills, unless mineral oil accomplishes it. In the presence of edema or toxic symptoms, the stronger saline cathartics are particularly useful.

Other Factors

Tepid baths followed by brisk rubbing of the skin are of value in the treatment of acute nephritis. Sweat baths, used in the management of edema and uremia, are seldom needed.

Focal infections are sometimes causative factors in nephritis. A thorough search should always be made for any possible foci. Infected teeth, tonsils, or sinuses should receive proper attention, in order to hasten recovery and prevent recurrence.

When there is an anemia associated with the nephritis it should receive appropriate treatment.

Treatment of Special Features

Edema is not, as a rule, an important feature in acute nephritis, and therefore seldom requires any special treatment. It will be discussed in a later chapter.

Uremia

Uremia is probably due to some unknown toxic substance which is formed and retained in the body. The best treatment is, therefore, the promotion of elimination. The quickest elimination is secured by venesection. Uremia constitutes a distinct indication for the removal of 400 to 800 cc. of blood. This should be followed by the injection of a corresponding or somewhat greater amount of physiologic salt solution, provided there are any signs of dehydration; if the patient is anemic there should be a transfusion of blood. Venesection may be repeated as necessary, but becomes an unsafe procedure if repeated too often without being followed by transfusion.

The next most important step in elimination consists in the administration of strongly acting saline cathartics, such as magnesium sulphate. Compound jalap powder, elaterin, or even croton oil may be used.

The third effective method for the promotion of elimination is that of sweating, which may be obtained by electric light baths, dry heat baths, hot water baths or hot packs. Best results are often obtained after repeated sweating; the first effort frequently is not highly successful. However, it must be remembered that sweats are depleting, and should seldom be repeated oftener than twice in twenty-four hours.

Paradoxical as it may seem, fluids should be forced during uremia. In the first place, an increased fluid intake is necessary to offset the fluids lost through stimulation of the eliminative processes. In the second place, the fluid may act as a diuretic, causing increased elimination of toxic substances through the kidneys. Thirdly, even though the fluid does not cause a diuresis it will dilute the toxins, and any edema that may follow it will disappear when the crisis is passed. When sufficient fluid intake cannot be forced by mouth it will be necessary to introduce liquids subcutaneously or intravenously.

The restlessness of uremia should be controlled by the administration of morphine hypodermically. This may obviate convulsive seizures. If it does not, these seizures are best controlled through the use of enough chloroform to induce a light anesthesia.

Uremic headache frequently disappears when eliminative measures are instituted. Barbiturates or coal tar derivatives may be prescribed for the relief of headache when necessary.

The diet during uremia should be limited to milk. Frequently it is possible to give but little of this, and temporary starvation may be necessary.

Suppression of Urine

The amount of urine is usually much decreased in acute nephritis, but seldom requires any special treatment. When suppression of urine accompanies uremia, it should respond to the measures ordinarily used in treating the uremia. When suppression is accompanied by few or no toxic symptoms the best procedure is to withhold any special treatment. More harm can be done by giving diuretic drugs and forcing fluids than by leaving the patient alone. Christian and O'Hare say, "The courage to withhold diuretics and not to flood the patient with fluids is a virtue badly needed under these conditions. Personally under these circumstances we would apply heat to the lumbar region, give a very simple diet of milk and crackers with a total fluid intake of 800 cc. to 1000 cc. and use no drugs whatsoever. If toxic symptoms begin to appear we would use sweats and catharsis; if they increase we would bleed. Our opinion is that recoverable cases of suppression of urine of this type get well on a minimum of treatment; if they continue long enough to develop toxic symptoms the probability of recovery is much reduced." Under exceptional conditions, such as the presence of a marked general anasarca with the suppression of urine, the advisability of decapsulation of the kidney must be considered.

(To be continued in the next issue of The Therapeutic Review.)

When Resistance Must be **STIMULATED**

Healing is an intrinsic function of the cellular structures. Medicine helps the ailing body to help itself; it cannot bring about a cure per se . . . The resistance mechanism, an intangible power which prepares the way for healing by overcoming the underlying etiologic factors of disease, frequently requires stimulation. Resistance cannot be synthesized and administered, but the waning mechanism can be stimulated into renewed activity . . . Ecthol (Battle), a tried and proven product, accomplishes this end. *The resistance curve rises when Ecthol (Battle) is administered . . .*

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